DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
WATER QUALITY MONITORING AND ASSESSMENT SECTION
WATERSHED INFORMATION SHEET

Cuivre River Basin-07110008

Basin Description

The Cuivre River basin lies in east central Missouri and flows in a southeasterly direction to its confluence with the Mississippi River about 15 miles northwest of St. Charles. The basin is 1,260 square miles in area and the major tributaries include the North and West Forks of the Cuivre River, and Indian, Coon, Elkhorn, Bear and Big creeks. The largest reservoir in the basin is Golden Eagle Lake with a surface area of 141 acres. There are no public drinking water reservoirs in this basin.

Average annual rainfall is 39 inches. Stream flow statistics for the basin are shown in Table 1.

Table 1. Stream Flow Statistics for the Cuivre River Basin

Stream/Location	Wtrshed. Area (sq.mi.)	Period Of Record	Flow (cfs)				
			90th Percentile *	Mean	Median **	10th Percentile ***	7Q10 Low Flow+
Cuivre R. nr. Troy	903	1922-72 1979-2004	1,240	673	92	6.0	0.3
W. Fk. Cuivre R. nr. Troy		1962-65					0.0
N. Fk. Cuivre R. nr Silex		1962-65					0.0
Big Cr. nr. Moscow Mills		1962-64					0.0

*Flow is less than this amount 90 percent of the time
**Flow is less than this amount 50 percent of the time
***Flow is less than this amount 10 percent of the time
+ The lowest average seven consecutive day flow that occurs with a recurrence interval of 10 years.

The Cuivre River basin lies within the Dissected Till Plains physiographic province. The western portion of the basin is part of the Central Claypan area, a flat landscape dominated by row crop agriculture. The remainder of the basin is a mixture of hills and plains with more pasture and forested land. In total, 53 percent of the land is row crop, 26 percent is pasture and hay fields and 19 percent forest.

Except for limited areas where streams may have incised Mississippian or Pennsylvanian aged rock, the surface of the basin is glacial till overlain by loess. Glacial till is a mostly unsorted mixture of clay, sand, gravel and rock debris created and pushed southward into Missouri by the great glacial ice sheets. Loess is a windblown silt deposit. Depth of the till is highly variable but is generally less than 50 feet. Loess deposits are 4-8 feet in

depth. In the very upper portions of the basin, cyclical (repetitive) deposits of sandstone, siltstone, shale, limestone and coal of Pennsylvanian age underlie these glacial deposits. In the northeastern corner of the basin, tectonic forces raised and fractured older rocks of Devonian and Ordovician age forming the area called the Lincoln Hills. In the remainder of the basin, limestones and shales of Mississippian age underlie the glacial deposits.

There are many small springs along the lower North Fork Cuivre River and its tributaries in the Lincoln Hills area and along the lower portion of the West Fork. There are few springs in the remainder of the basin, despite the fact that the Cuivre River incises the Burlington-Keokuk and other limestones. This indicates that the presence of the clayey till and the underlying shale and coal beds ensure there is very little movement of water to the subsurface. Most water movement in the basin is through the surface stream network. Water that reaches the subsurface will resurface locally when a stream valley incises a confining aquatard (an impermeable layer). Since very little water infiltrates to the subsurface, streamflow can be very high during wet weather. For the same reason, base flows, streamflow sustained only by the re-emergence of groundwater into the stream, are very low during the intervening dry periods.

Water Quality Concerns

Acceptable water quality is defined by Missouri's Water Quality Standards [http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf] . Streams or lakes that do not meet these standards are considered "impaired." They may not be fit for certain uses such as swimming, drinking water supply or protection of fish and other aquatic life. Waters are considered to be "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list more than 3,600 classified streams and more than 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are small tributaries to classified streams. They typically have flowing water only during wet weather and are dry for the remainder of the year.

Water Quality in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-prairie-str.pdf

Aquatic Habitat in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/aquatic-hab-prairie-str.pdf

Point Source Pollution

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as "domestic wastewater". It contains primarily treated human

wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as Biological Oxygen Demand (BOD), suspended solids, and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are 62 permitted domestic or industrial/commercial point sources that discharge a combined 8.15 million gallons per day (mgd) of treated wastewater into the waters of the Cuivre River basin. There are 406 miles of classified streams in the basin, of which 2.8 miles (less than 1 percent) are known to be affected or impaired by point source wastewater discharges. There are also two miles of unclassified streams affected or impaired by point source wastewater discharges. Wastewater discharges that affect at least 0.5 miles of their receiving streams include municipal discharges from the New Florence East, New Florence North and Bellflower wastewater plants.

Wastewater Treatment
http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf

Nonpoint Source Pollution

Nonpoint source pollution occurs when pollutants enter bodies of water at points that are ill-defined and unstable. Examples include the erosion of sediments or the entrance of polluted surface runoff or groundwater into lakes and streams. Locations of nonpoint source pollution are often widely dispersed and are difficult to identify or control. In the Cuivre River basin, the most serious nonpoint problem is degradation of aquatic habitat. A total of 121 miles (30 percent) of classified streams in the basin are considered to have degraded aquatic habitat. The lack of infiltration of rainfall, when combined with local soil tillage and other land uses leads to a large amount of surface runoff during wet weather. This contributes to soil erosion and high levels of sediment deposition in streams. The quality of aquatic habitat is further impaired by removal of wooded riparian vegetation. Fish collections by the Department of Conservation indicate significant loss of benthic (bottom dwelling) fishes in some tributaries such as Lead, Mill, Elkhorn and Big creeks has occurred since the 1940s. Loss of benthic fishes suggests that increased sedimentation in these streams may be a problem. The complete report by the Department of Conservation on the Cuivre River basin can be found on the Web at
http://www.conservation.state.mo.us/fish/watershed/cuivre/contents/070cotxt.htm

Storm water runoff in the Midwest can also carry significant amounts of fertilizers, animal wastes, and pesticides into streams.

During warm weather when stream flows are low, livestock tend to gather in and around streams. The wastes they leave in the water contribute to nuisance algae growths, low levels of dissolved oxygen and elevated levels of ammonia and bacteria.

Groundwater from bedrock aquifers is used for all public and most private drinking water supplies in this basin. Along the northern and western edges of the basin bedrock aquifers become increasingly saline and are unfit for either drinking water or for agricultural irrigation. Pumping large amounts of groundwater from areas just south of the divide between saline and fresh groundwater can cause migration of saline groundwater southward. Movement of the saline-fresh groundwater divide southward would result in the loss of groundwater use for drinking water or irrigation in the affected area.

There have been no large studies of water quality in private wells in this portion of the state. However, studies of private wells in northern and western Missouri show that about one third of these wells exceed the drinking water standard for nitrate and about two percent exceed drinking water standards for pesticides. This contamination is often caused by local land use practices or surface contamination of the wellhead and does not represent widespread contamination of the underground aquifer. Deeper aquifers are protected from surface contamination by impermeable strata.

Water Quality Management

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative program between the Department of Natural Resources and other federal, state and local government agencies or organizations, local landowners and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint pollution. The most commonly supported practices are those that control soil erosion on agricultural and urban lands, improve quality and quantity of forage on grazing lands, protect riparian zones, and those that control runoff of animal manure, fertilizers and pesticides. The state nonpoint source management plan is a voluntary program that provides funds to help defray the cost of adopting management practices.

Since 1990, there have been eight nonpoint source watershed projects in the basin. These projects have been funded by state sales tax money earmarked for soil and water

conservation. These projects treated more than 15,800 acres of land, comprising about 3 percent of the entire basin.

Table 3. Nonpoint Source Watershed Projects in the Cuivre River Basin

Watershed Name	County	Project Date	Watershed Size (Acres)	Acres Treated	Percent of Watershed Treated
Yeater Branch	Warren	1991-95	3,799	2,276	60%
Little Coon Cr.	Montgomery	1992-96	4,313	2,547	59%
Bear Cr.	Montgomery	1993-97	5,700	2,403	42%
Little Lead Cr.	Lincoln	1994-98	6,628	2,088	42%
Wolf Cr.	Montgomery	1992-99	10,400	6,736	65%
Camp Branch	Warren	1994-99	10,664	6,278	59%
Elkhorn Creek	Montgomery	2001-07			
Bear, Brush Creek	Montgomery	2005-12			

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

Web links

US Geological Survey http://mo.water.usgs.gov/

Kansas City District Corps of Engineers http://www.mvs.usace.army.mil/

Missouri Department of Conservation
http://www.mdc.mo.gov/fish/watershed/cuivre/070cotxt.htm

US Environmental Protection Agency http://www.epa.gov/region7/water/index.htm